2007 RESEARCH PROBLEM STATEMENT

Problem Title: Cold Temperatures and Fatigue Quality Control Test for Asphalt Mixes **No.:** 07.03-01

Submitted By: Kevin VanFrank **Email:** kvanfrank@utah.gov

Project Champion: Kevin VanFrank

(UDOT or FHWA employee who needs this research done, will help the Research Division lead this project, and will spearhead the implementation of the results. If the project gets prioritized at the UTRAC conference, a Champion Commitment Form will be required before funding.)

1. Briefly describe the problem to be addressed.

With the resolution of rutting in asphalt pavements by implementation of the Hamburg Wheel Tracking test and modification to the Superpave PG requirements, cold temperature cracking and intermediate temperature fatigue is coming to the fore as the primary mix design challenge. UDOT is also considering using RAP and other hot-mix additives to enhance pavement life and performance. Binder tests alone are not enough to identify potential hot-mix modification effects. A rapid hot-mix test to control cold temperature characteristics during HMA production is required to resolve this issue.

2. Strategic Goal: ☒ Preservation ☐ Operation ☐ Capacity ☐ Safety (check all that apply)

3A. List the research objective(s) to be accomplished:

1. Identify potential test candidates that that can measure creep compliance of hot-mix at cold temperatures and/or direct tension. Include Superpave binder test (bending beam rheometer), four point bending and "Texas half-puck direct-tension" test as part of review.
2. Peform Ruggedness Testing
3. Tie to Design Parameters and established tests such as IDT.
4. Develop a repeatable test protocol and determine its precision
5. Develop QC specifications using the compliance data (cold temperatures e.g. @ at low PG temp.)

3B. List the major tasks to accomplish the research objective(s): **Estimated person-hours:** 700

1. Conduct literature review to identify potential specification parameters for cold weather cracking and fatigue cracking
2. Identify 6 mixes which provide a control and cold weather transverse and fatigue cracking
3. Develop coring scheme to provide specimens from existing pavements
4. Testing
5. Specification Development

4. Estimate the cost of this research study including implementation effort (use person-hours from No. 3B): $100,000

5. Indicate type of research and/or development project this is

Large: ☒ Research Project ☐ Development Project

Small: ☐ Research Evaluation ☐ Experimental Feature ☐ New Product Evaluation ☐ Tech Transfer Initiative

☐ Other: _____

(A small project is usually less than $20,000 and shorter than 6 months)

6. Outline the proposed schedule (when do you need this done, and how will we get there):

This project will require 2 to 3 years to accomplish.

1st 6 mos. Identify test options and mixes and obtain materials. Develop test apparatus.

2nd, 3rd , and 4th 6 mos. Testing

5th 6 mos. Data analysis, spec. writing

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7. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?
Consultant, University, and UDOT Staff

8A. What deliverables would you like to receive at the end of this project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)

1. A QC test method and protocol to mitigate cold temperature cracking and intermediate temperature fatigue cracking
2. Training for UDOT staff to run the specification test given above
3. QC specification to mitigate cold and intermediate temperature cracking

8B. Describe how this project will be implemented at UDOT.

1. Method would be used to control the production of HMA for low temperature performance.
2. Method would be implemented into specification and the test would be used for daily mix property control
3. Test results would become a pay item with incentive and disincentive.

8C. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.
The regions would obtain a mix performance validation tool that will prevent low and moderate temperature cracking. A more uniform and predictable mix will provide performance more in line with design requirements.

9. Describe the expected risks and obstacles as well as the strategies to overcome them.
The main risk is that the test will become time consuming, complicated and costly. Many tests exist in this category that exhibit the aforementioned attributes. Our task is to simplify and streamline. In so doing, we may find the variability to be excessive. Our strategy would include working on several scales to develop the smallest test sample which provides the necessary information.

10A. List other people (UDOT and non-UDOT) who are willing to participate in the Technical Advisory Committee (TAC) for this study:

Name	Organization / Division / Region	Phone	Email
Howard Anderson	UDOT/Materials/Complex	965-4303	handerson@utah.gov
Rod Terry	UDOT/Materials/R1	620-1606	rterry@utah.gov
Pedro Romero	UofU	587-7725	romero@civil.utah.edu
Raj Dongre	Dongre Laboratory Services	703-395-8854	rajdongre@dongrelabs.com
Tim Biel	UDOT/Materials/Complex	965-4859	tbiel@utah.gov
Mehai Marasteanu	University Of Minnesota	612-625-5558	maras002@umn.edu

10B. Identify other Utah, regional, or national agencies and other groups that may have an interest in supporting this study:
University of Minnesota (Dr. Mihai Marasteaneu)